

NON-PUBLIC?: N  
ACCESSION #: 9010170161  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 2 PAGE: 1 OF 06

DOCKET NUMBER: 05000353

TITLE: Reactor SCRAM resulting from a spurious trip signal from a Steam  
Leak Detection System Temperature Switch  
EVENT DATE: 09/10/90 LER #: 90-015-00 REPORT DATE: 10/10/90

OTHER FACILITIES INVOLVED: LGS Unit 1 DOCKET NO: 05000352

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:

50.73(a)(2)(iv) & OTHER: Special Report

LICENSEE CONTACT FOR THIS LER:

NAME: Gil J. Madsen, Regulatory Engineer, TELEPHONE: (215) 327-1200  
Limerick Generating Station

COMPONENT FAILURE DESCRIPTION:

CAUSE: B SYSTEM: CE COMPONENT: TDS MANUFACTURER: R278  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 10, 1990, a Unit 2 Reactor Protection System (RPS) actuation occurred resulting from an actuation of the Primary Containment and Reactor Vessel Isolation Control System (PCRVICES) Engineered Safety Feature (ESF) actuations. A PCRVICES Group I Main Steam Isolation Valve (MSIV) isolation signal occurred due to a spurious trip signal on the 'D' channel of the Steam Leak Detection System (SLDS) when a temperature switch momentarily spiked when an operator repositioned the switch while Instrumentation and Control technicians were simultaneously testing the 'A' channel of the SLDS. Reactor Pressure Vessel (RPV) pressure increased to 1120 psig and RPV level decreased from a normal operating level of +35 inches to -48 inches instrument level. Additional PCRVICES actuation signals were received and appropriate valve and damper motion occurred. The Reactor Core Isolation Cooling (RCIC) system received an initiation signal on low low RPV level and injected into the RPV.

Operators restored RPV pressure and level to normal post SCRAM operating levels by 0941 hours. The cause of the event was a spurious trip signal from a Steam Leak Detection System temperature switch. The isolation signals were reset by 0948 hours. The temperature switch was replaced and the failure mechanism of the temperature switch is under investigation. A Shift Training Memorandum was issued and will be incorporated into the Operating Manual to formalize control of testing of both channels of any PCRVICES logic while daily operator readings are being taken.

END OF ABSTRACT

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Unit Conditions Prior to the Event:

Instrumentation and Controls (I&C) technicians were performing Unit 2 Surveillance Test (ST) procedure ST-2-025-600-2, "NSSSS - Temperature Element Main Steam Line Tunnel Temperature - High; Division 1A/Channel A Functional Test." This test trips the Main Steam Line isolation logic Channel A. A plant operator was performing ST procedure ST-6-107-590-2, "Daily Surveillance Log, OPCONS 1, 2 and 3," which includes taking Steam Leak Detection System readings on instruments located in the Auxiliary Equipment Room. There were no other structures, systems or components out of service or being tested which contributed to this event.

Unit 1 Operating Condition was 4 (Cold Shutdown) at 0% power level

Unit 2 Operating Condition was 1 (Power Operation) at 100% power level

Description of the Event:

On September 10, 1990, at 0911 hours, a Unit 2 Reactor Protection System (RPS, EIIS:JD) actuation occurred resulting from an actuation of the Primary Containment and Reactor Vessel Isolation Control System (PCRVICES)(EIIS:JM), an Engineered Safety Feature (ESF) actuation. A PCRVICES Group I, Main Steam Isolation Valve (MSIV)(EIIS:ISV) isolation signal occurred due to a spurious 'D' channel trip signal when a Steam Leak Detection System (SLDS)(EIIS:IJ) temperature switch inadvertently spiked when an operator repositioned the switch during performance of Surveillance Test (ST) procedure ST-6-107-590-2, "Daily Surveillance Log, OPCONS, 1, 2, and 3, while I&C technicians were simultaneously testing the 'A' channel of the SLDS.

Immediately following the SCRAM, Reactor Pressure Vessel (RPV) level decreased from the normal operating level of +35 inches instrument level to -48 inches instrument level. RPV level was restored to normal using

the Reactor Core Isolation Cooling (RCIC) system (EIIS:BN), which received an automatic initiation signal at -38 inches instrument level and injected into the RPV. The High Pressure Coolant Injection (HPCI) system (EIIS:BG) received an initiation signal of insufficient duration (approximately 8.2 seconds) to complete actuation of the system. Therefore, the HPCI system did not automatically inject into the RPV. Main Control Room (MCR) operators attempted to operate the HPCI system in the full flow test mode to aid in RPV depressurization. However, the HPCI system full flow test return valve, "HV-55-2F011," to the Condensate Storage Tank (CST) failed to open electronically. Approximately 25 minutes after the SCRAM, operators manually opened the valve to facilitate system operation.

The RPV pressure spike (approximately 1120 psig) caused by the MSIV isolation resulted in a Main Steam Relief Valve, PSV-41-2F013N (EIIS:RV), lifting for approximately 20 seconds. Reactor pressure control was subsequently maintained

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using manual control of Main Steam Relief Valves PSV-41-2F013H,K,M,S and E and by manual use of the HPCI system in the full flow test mode. During the event, suppression pool temperatures increased to a peak value of 105 degrees F.

MCR operators restored RPV pressure and level to their normal operating levels within 30 minutes of the event, by 0941 hours.

Automatic ESF actuations of the following systems or subsystems occurred during the event as a result of RPV level decreasing below low-low RPV level (< -38 inches instrument level):

- o PCRVICES Isolation Groups IIC (Residual Heat Removal (RHR)(EIIS:KE) Heat Exchanger Vacuum Breaker Lines), III (Reactor Water Cleanup Lines), VIIB (Primary Containment Instrument Gas TIP Purge Supply), VIIIB (Miscellaneous Process Lines), Secondary Containment Barrier Blocks/Vent Valves
- o Reactor Enclosure Ventilation System isolation
- o Start of the A and B Standby Gas Treatment System (SGTS)(EIIS:TE) trains (involving refuel floor areas common to Unit 1)
- o Start of the 'A' Reactor Enclosure Recirculation System train

(EHS:VA)

PCRVICES Isolation Groups IB (Main Steam and Reactor Water Sample), and VIB (Primary Containment Exhaust to Reactor Enclosure Equipment Compartment Exhaust and Nitrogen Block Valves) received isolation signals on low-low RPV level however, there was no valve motion since these valves were normally closed during power operation.

A PCRVICES isolation signal for low RPV level (level) was also initiated for the Groups IIA (RHR Shutdown Cooling) and IIB (RHR Heat Exchanger Sample Lines and Drain to Radwaste) valves, but again these valves were closed normally during power operation.

Operations personnel manually operated the RCIC system to maintain RPV level and remove residual heat for 2 hours and 27 minutes.

The reactor parameters prior to the injection were as follows:

Reactor Thermal Power: 3285 MWth (99.8%)  
Reactor Vessel Dome Pressure: 1001.4 PSIG  
Core Moderator Temperatures: 540.0 degrees F  
Core Flow: 103.45 Mlbm/hr  
Feedwater Flow: 14.06 Mlbm/hr  
Feedwater Temperature: 419.52 degrees F

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This injection represents the ninth Unit 2 RCIC system actuation cycle to date.

After the reactor was stabilized and the isolation signals were verified to be spurious, Operations personnel reset the PCRVICES isolations per General Plant procedure GP-8, "Primary and Secondary Containment Isolation Verification Reset," by 0948 hours on September 10, 1990.

A four-hour notification was made to the NRC in accordance with 10CFR50.72(b)(2)(ii) since this event resulted in automatic actuation of the RPS and several ESFs. This LER is being submitted in accordance with the requirements of 10CFR50.73(d)(2)(iv). This LER is also being submitted as a Special Report pursuant to Technical Specifications (TS) Reporting Requirement 6.9.2, as required by TS Action 3.7.3b since the RCIC system injected to the RPV.

Reporting Requirements:

Technical Specifications (TS) 3/4.7.3, Reactor Core Isolation

### Cooling System, Limiting Conditions for Operation Action 3.7.3b

In the event the RCIC system is actuated and injects water into the Reactor Coolant system, a Special Report shall be prepared and submitted to the Commission pursuant to specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

### TS Special Reports 6.9.2

Special reports shall be submitted to the Regional Administrator of the Regional Office of the NRC within the time period specified for each report.

#### Analysis of the Event:

There were no adverse consequences as a result of this event. There was no release of radioactive material as a result of this event. The MSIV closure caused a reactor SCRAM as designed and all control rods (EIIS:AA) fully inserted. MCR operators responded quickly to the isolation and SCRAM and restored RPV pressure and level to their normal post SCRAM operating levels within 30 minutes.

Immediate and follow-up actions to this type of event (i.e., loss of vessel inventory) are provided in Transient Response Implementation Plan (TRIP) procedure T-101, "RPV Control." Licensed operators receive requalification training to review and perform operator responses to transients of this type. This training provides practice on immediate operator actions and minimizes the

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length of time certain systems are isolated reducing the adverse impact on the plant. Therefore, as a result of adequate procedural guidance, prompt communications, training, and prompt operator actions, the event duration was limited and no adverse plant conditions developed.

The following automatic RPS actuation signals also occurred that would have actuated a SCRAM if the MSIV closure signal had failed.

- o RPV pressure > 1037 psig
- o RPV water level < +12.5 inches
- o Turbine Control Valve fast closure

#### Cause of the Event:

The cause of the event was unexpected equipment failure. The Steam Leak Detection System temperature switch, TTS-25-216D, spiked momentarily during routine surveillance by Operations personnel. This spike resulted in a spurious PCRVICS isolation signal. The cause of the spike is under investigation. Previous spiking had been experienced on the Riley temperature switches, but a plant modification was implemented in February of 1985 to add a resistor in the circuit board and correct the problem. The failed temperature switch has been sent to General Electric Co. (GE), supplier of the SLDS, for further analysis. An additional causal factor was repositioning of the temperature switch concurrent with testing on equipment associated with the opposite channel of the PCRVICS isolation logic.

#### Corrective Actions:

The temperature switch, TTS-25-216D, was replaced by I&C personnel on September 11, 1990. The failed temperature switch was sent to GE for further analysis and, if significant additional corrective actions are identified, they will be included in a supplement to this report. Additionally, a plant modification is being considered to replace all Riley temperature switches and transmitters with a different type of instrument in order to increase the reliability of the SLDS.

The cause of the HPCI system full flow test return valve to the CST failure was investigated by maintenance personnel and determined to be a torque switch setting set too low. The torque switch was adjusted and the valve was tested satisfactorily on September 12, 1990.

A Shift Training Memorandum was issued by Operations supervision to Operations shift personnel on September 12, 1990, describing the SCRAM. The memorandum defined a program whereby I&C personnel will not be permitted to perform any STs which require initiation of a single channel of the PCRVICS or RPS isolation logic, until Operations personnel have completed their daily ST. This program

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will be incorporated into the "Operations Surveillance Test Guidelines" section of the Operations Manual by December 17, 1990.

#### Previous Similar Occurrences:

No previous SCRAMs have occurred on either Unit at LGS due to the cause of this event. However, several Reactor Water Cleanup (RWCU) system isolations had occurred on LGS Unit 1 due to similar spikes from Riley temperature switches. These RWCU isolations were reported in LGS Unit 1

LERs 84-012, 84-026, 84-034 and 84-036. A plant modification had been completed in February of 1985 that was expected to correct the temperature switch design deficiency.

Tracking Codes: B99 Deficient Equipment

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TS 6.9.2

PHILADELPHIA ELECTRIC COMPANY

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M. J. McCORMICK, JR., P.E. October 10, 1990

PLANT MANAGER

LIMERICK GENERATING STATION Docket Nos. 50-352

50-353

License Nos. NPF-39

NPF-85

U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, DC 20555

SUBJECT: Licensee Event Report

Limerick Generating Station - Units 1 and 2

This LER and Special Report concerns a Unit 2 reactor SCRAM, a Reactor Protection System actuation, resulting from closure of the Main Steam Isolation Valves, an actuation of the Primary Containment and Reactor Vessel Isolation Control System, an Engineered Safety Feature, and resultant automatic initiation of the Reactor Core Isolation Cooling System due to a spurious trip signal from a Steam Leak Detection System temperature switch.

Reference: Docket No 50-353

Report Number: 2-90-015

Revision Number: 00

Event Date: September 10, 1990

Report Date: October 10, 1990

Facility: Limerick Generating Station  
P.O. Box A, Sanatoga, PA 19464

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(iv). This LER is also being submitted as a Special Report pursuant to Technical Specifications Reporting Requirement 6.9.2, as required by Technical Specifications Action 3.7.3b.

Very truly yours,

DCS:rgs

cc: T. T. Martin, Administrator, Region I, USNRC  
T. J. Kenny, USNRC Senior Resident Inspector, LGS

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